

Remote-sensing supported global terrestrial biodiversity monitoring



EarthEnv



Yale

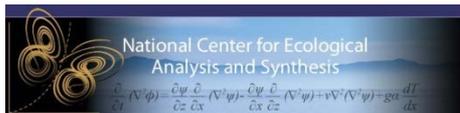
Walter Jetz
EEB, FES
Yale University

Remote-sensing supported global terrestrial biodiversity monitoring

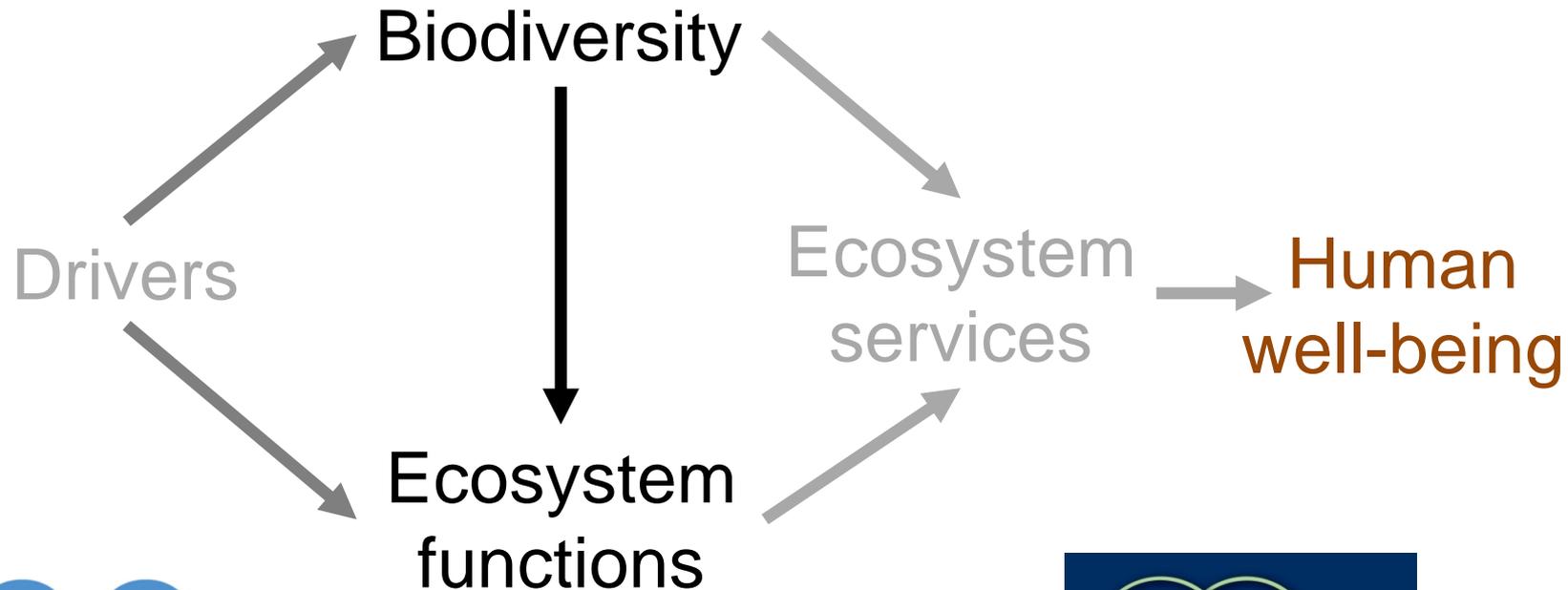
PIs: Walter Jetz (Yale U), Rob Guralnick (CU Boulder), Brian McGill (U Maine), Rama Nemani (NASA Ames), Forrest Melton (NASA Ames)

Postdocs, Students: Dr. Mao-Ning Tuanmu (Yale U, NASA-funded), Dr. Adam Wilson (Yale U, YCEI-funded), Dr. Benoit Parmentier (NCEAS/ U Maine, iPlant-funded), Brian Stucky (CU Boulder, NASA-funded), Giuseppe Amatulli (Yale U)

Others: Jeremy Malczyk (Yale U), Map of Life Team (Yale, Boulder), Dave Thau (Google)

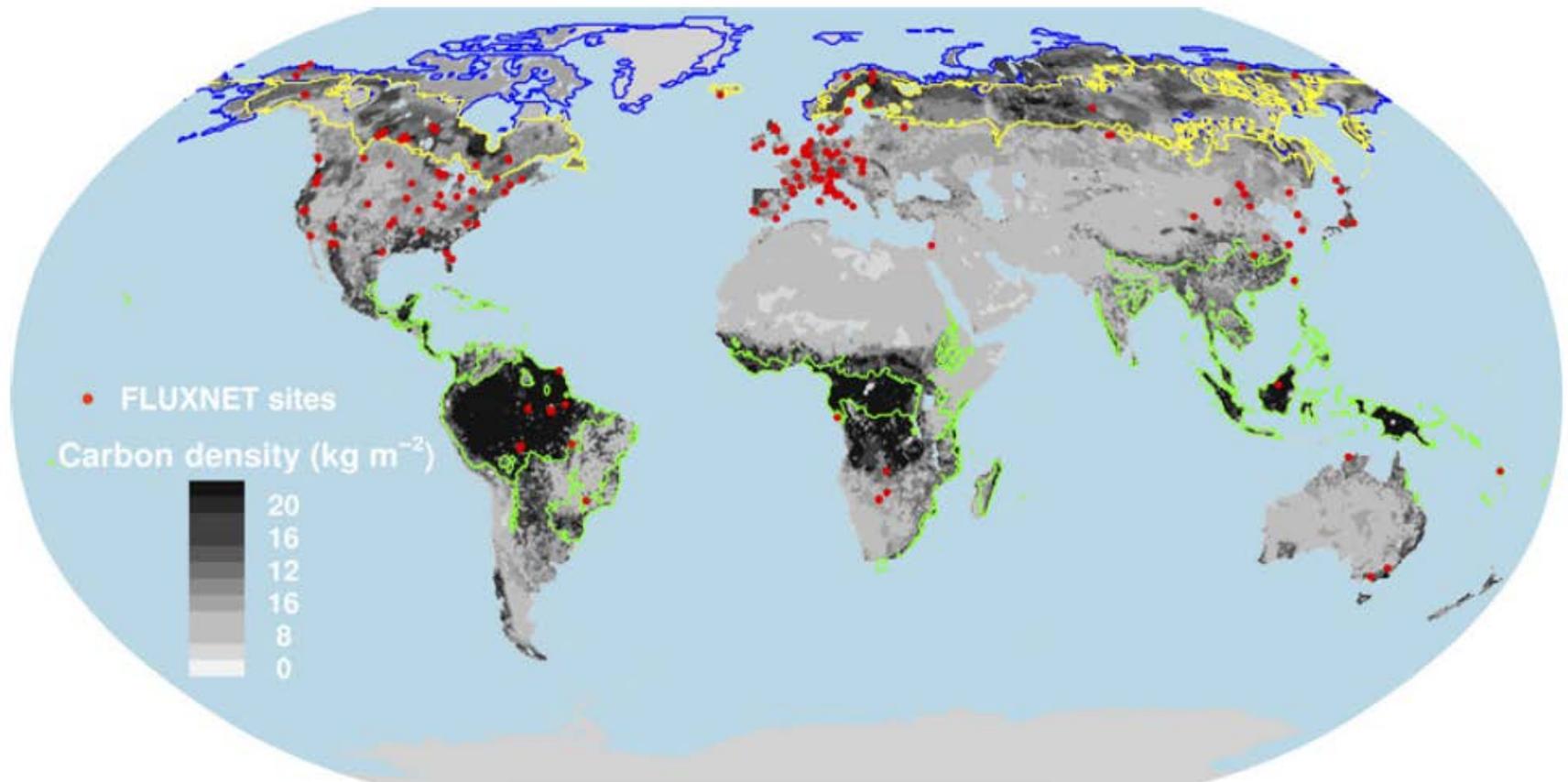


Monitoring the health of our planet



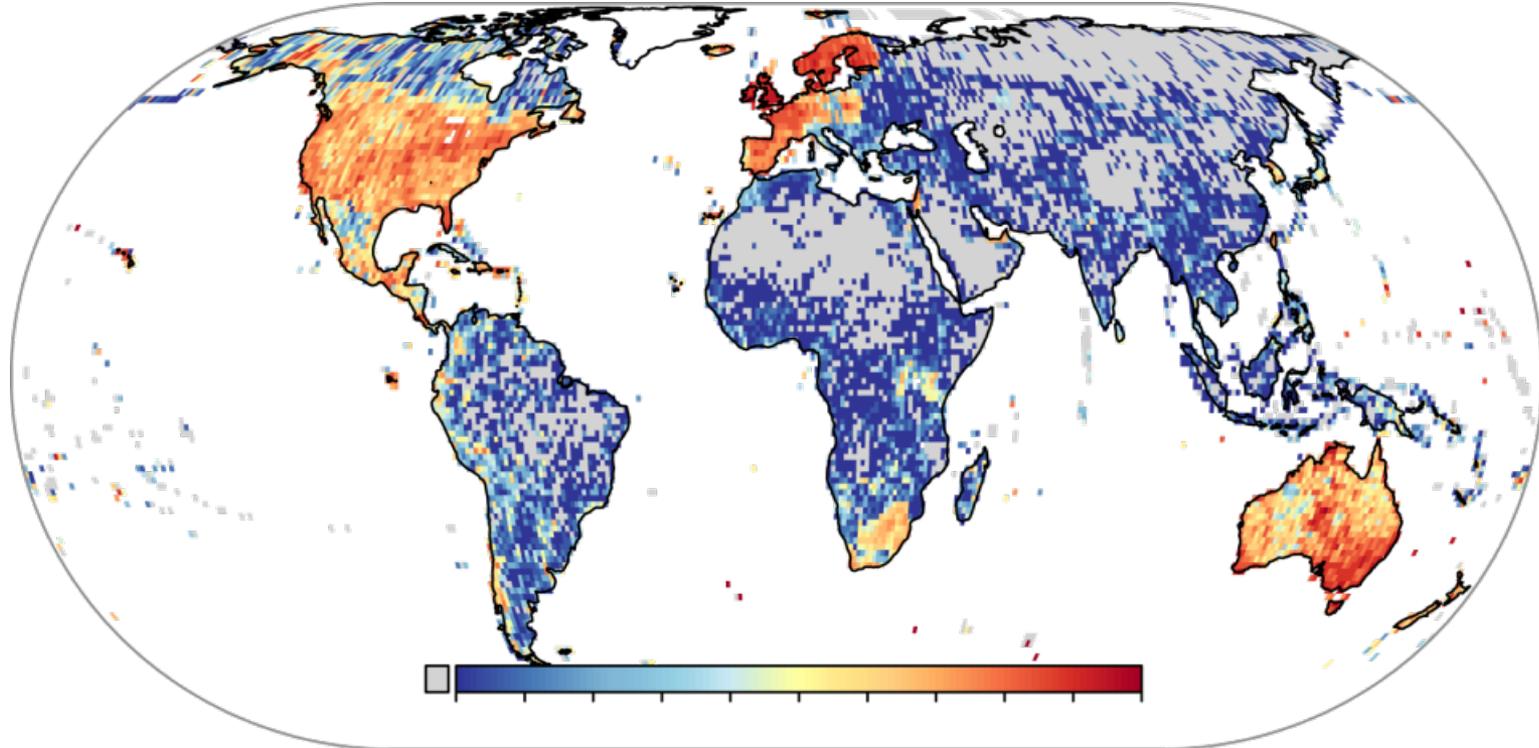
Monitoring the health of our planet

Biased evidence – Ecosystem functions



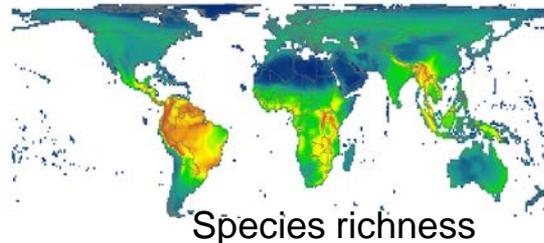
Monitoring the health of our planet

Biased evidence – Biodiversity



>0 20 40 60 80 100

**Inventory completeness (%)
Terrestrial vertebrates**

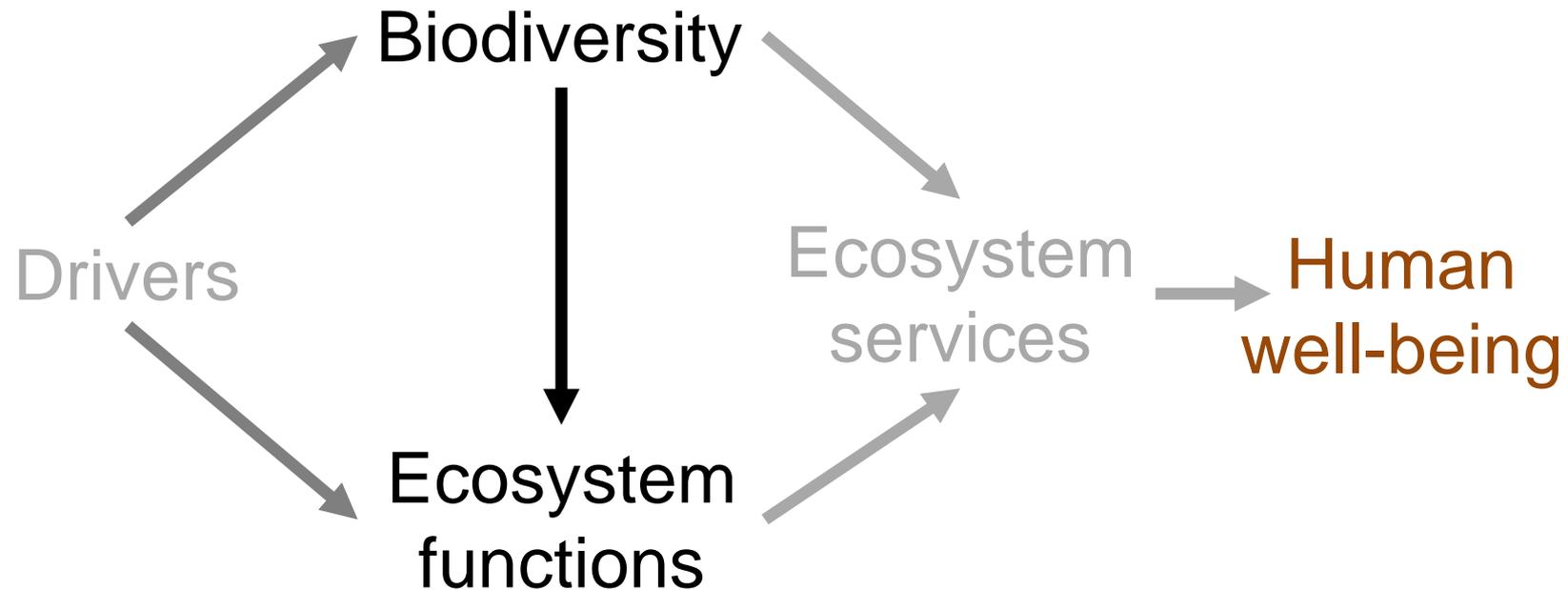


Species richness

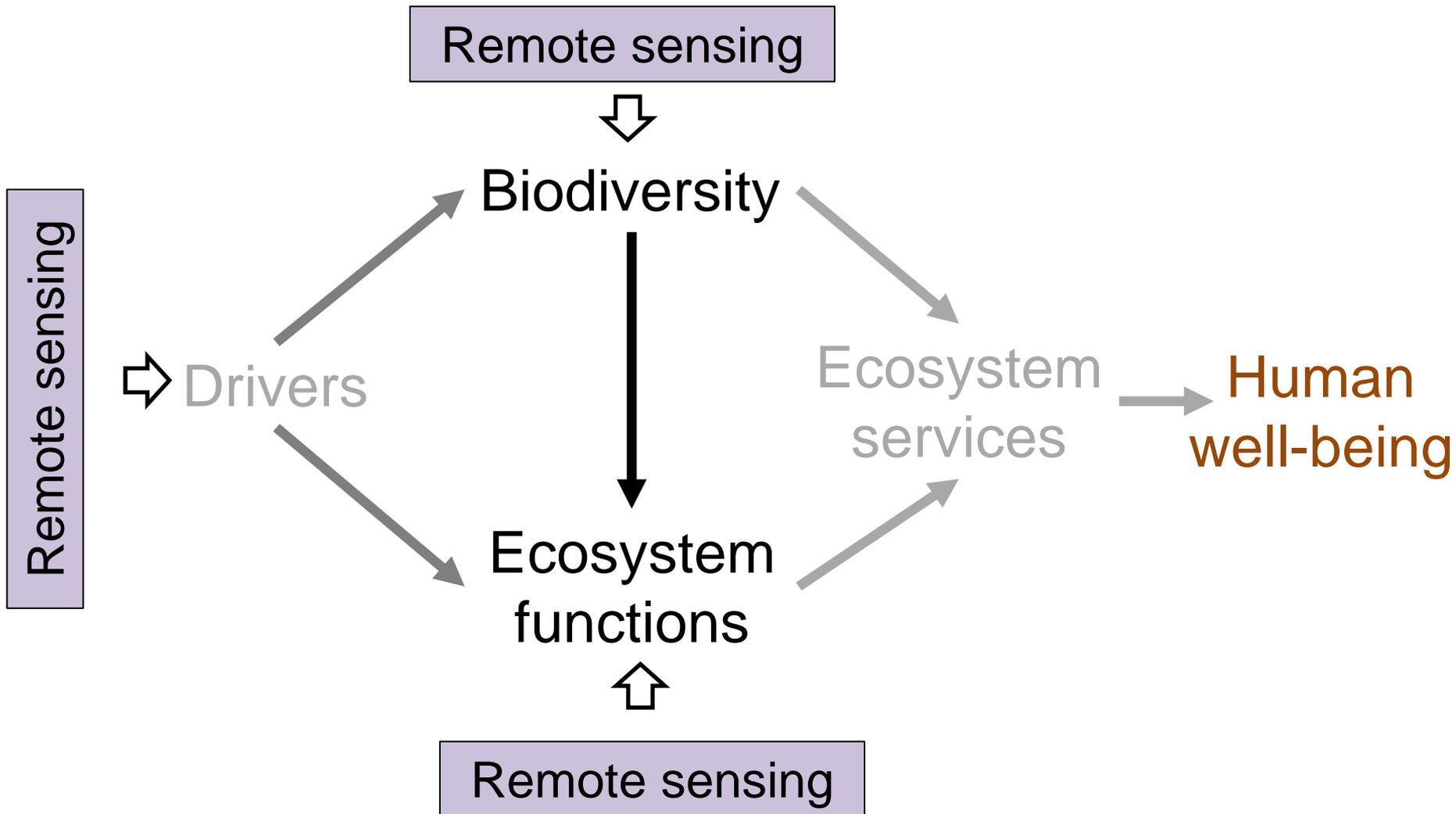


Meyer et al., Nature
Communications 2015

Monitoring the health of our planet

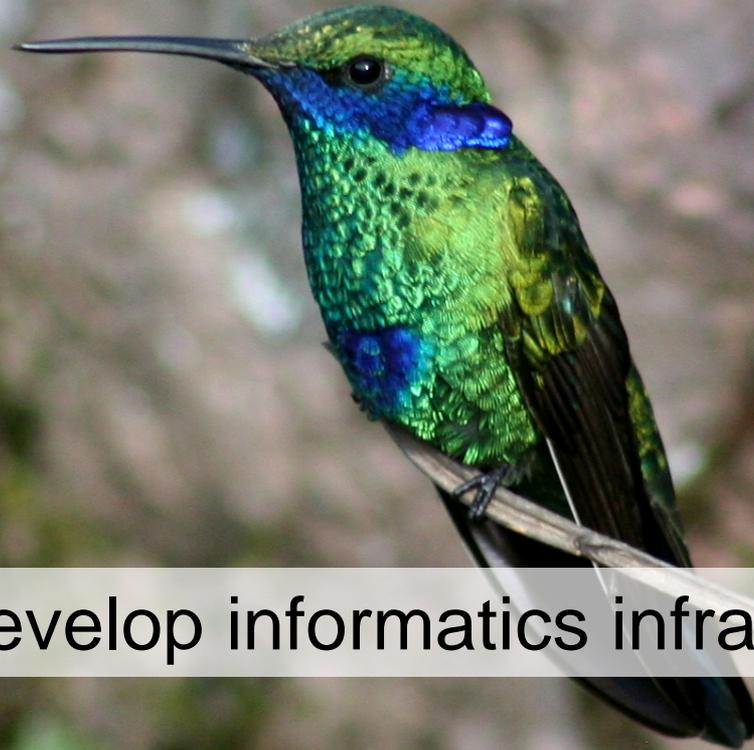


Monitoring the health of our planet



I. Develop, assess global remote sensing layers for biodiversity modeling

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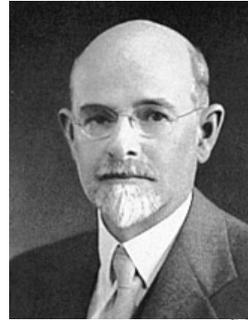
II. Develop informatics infrastructure



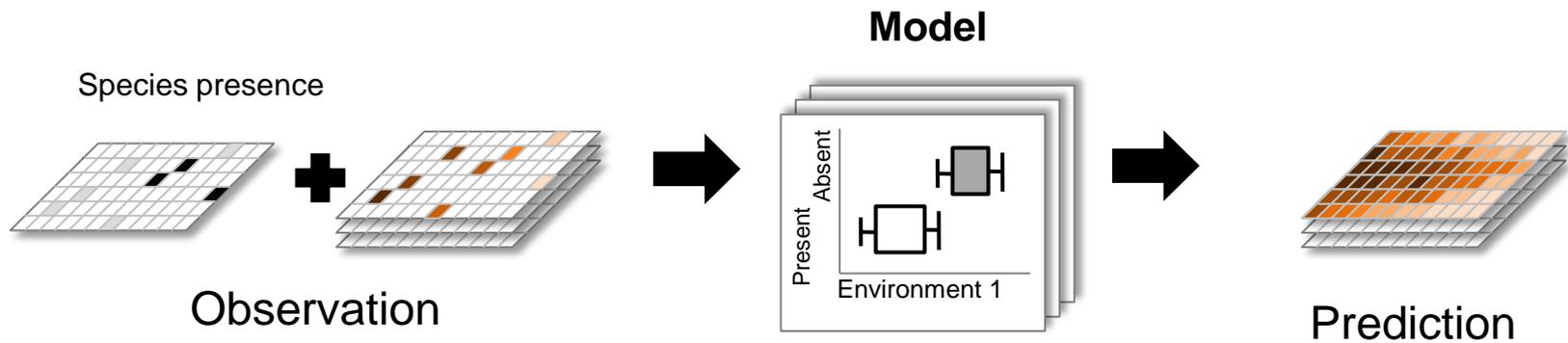
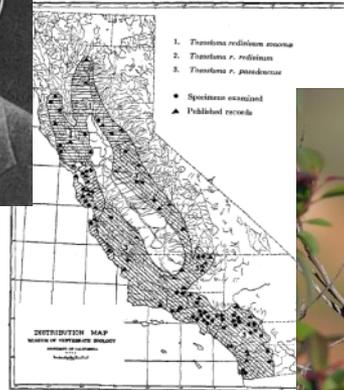
III. Begin to support global monitoring



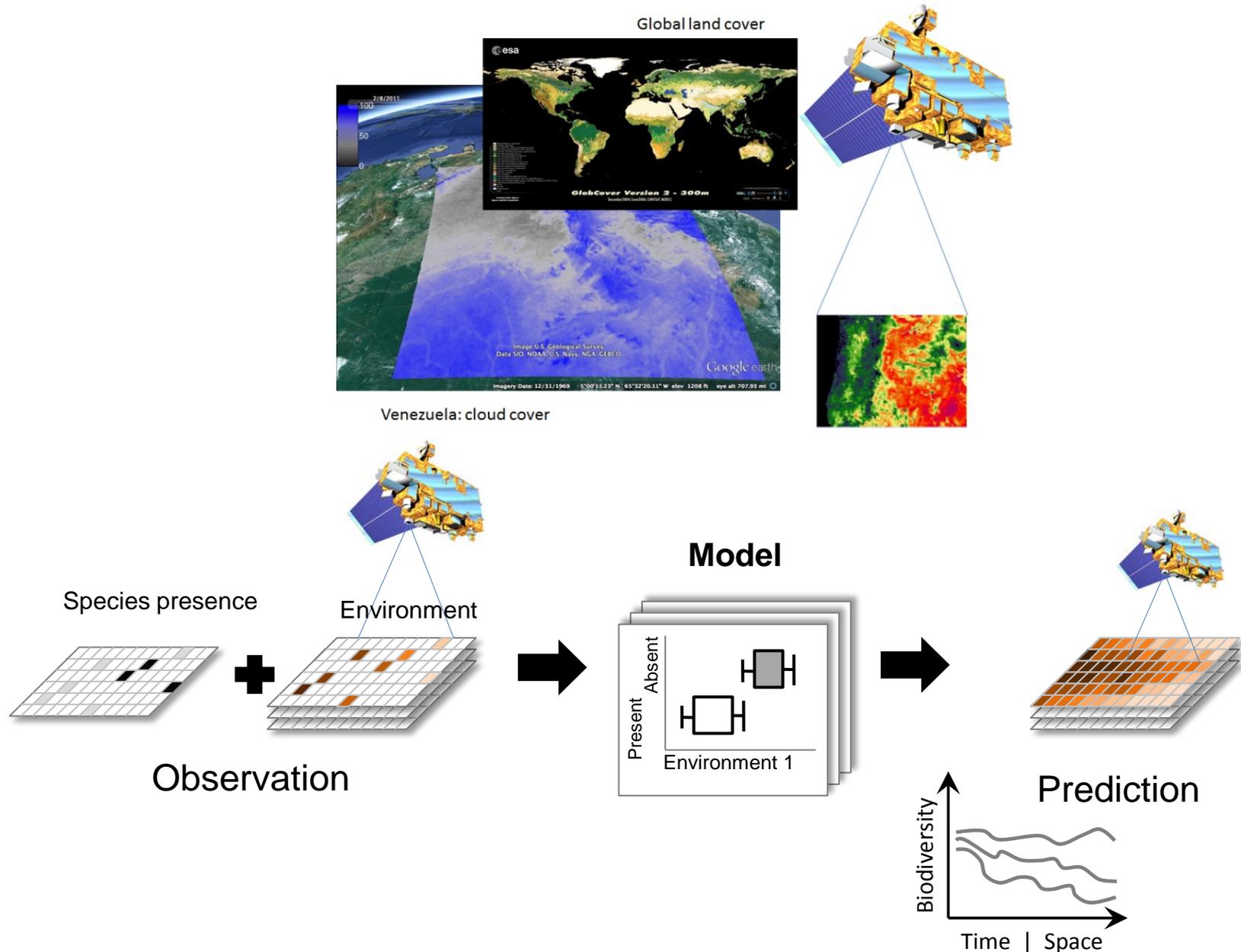
Environmental niche modeling



Joseph Grinnell
(Berkeley)

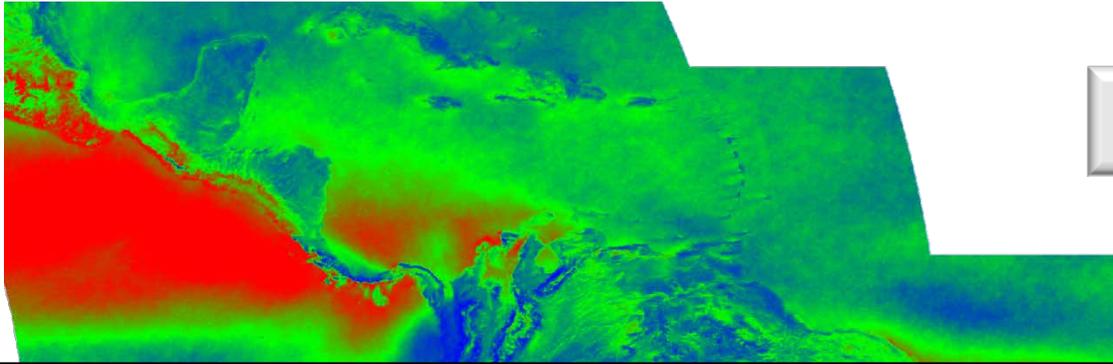


Environmental niche modeling





Adam Wilson
Yale



Clouds

A screenshot of a New York Times article. The page header includes "SECTIONS", "HOME", "SEARCH", and "The New York Times" logo. The article is in the "SCIENCE" section, titled "A Cloud Atlas Provides Clues to Life on Earth" by Joanna Klein, dated April 4, 2016. The article features a large image of a mountain range shrouded in mist. To the right of the article is a circular polar projection map showing seasonal cloud cover patterns, with months labeled from April to August. The map shows a color gradient from green to blue, indicating seasonal changes in cloud cover.

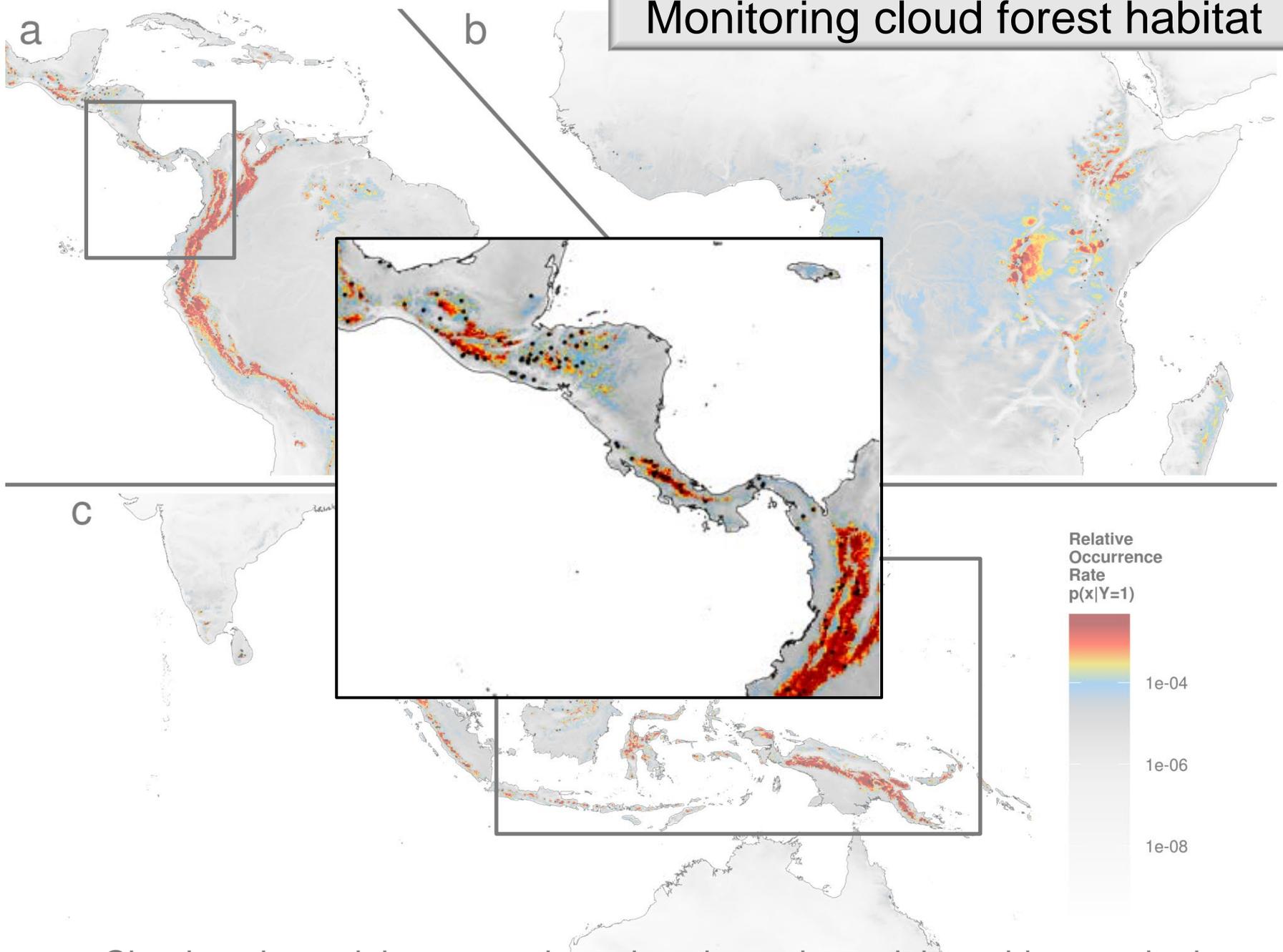


Seasonality

Monitoring cloud forest habitat



Monitoring cloud forest habitat

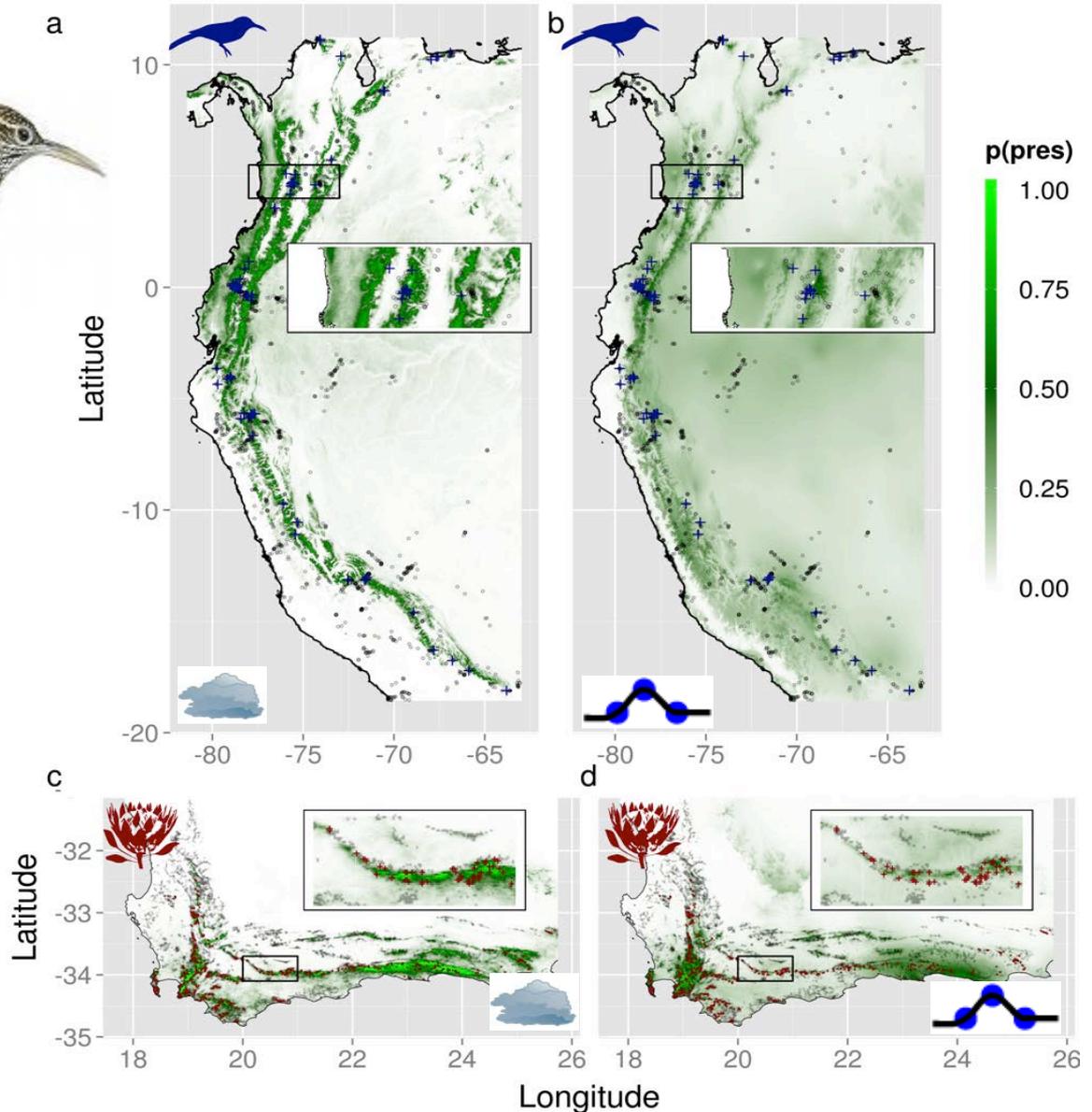


Clouds-only model stronger than elevation-only model, enables monitoring

Environmental niche modeling



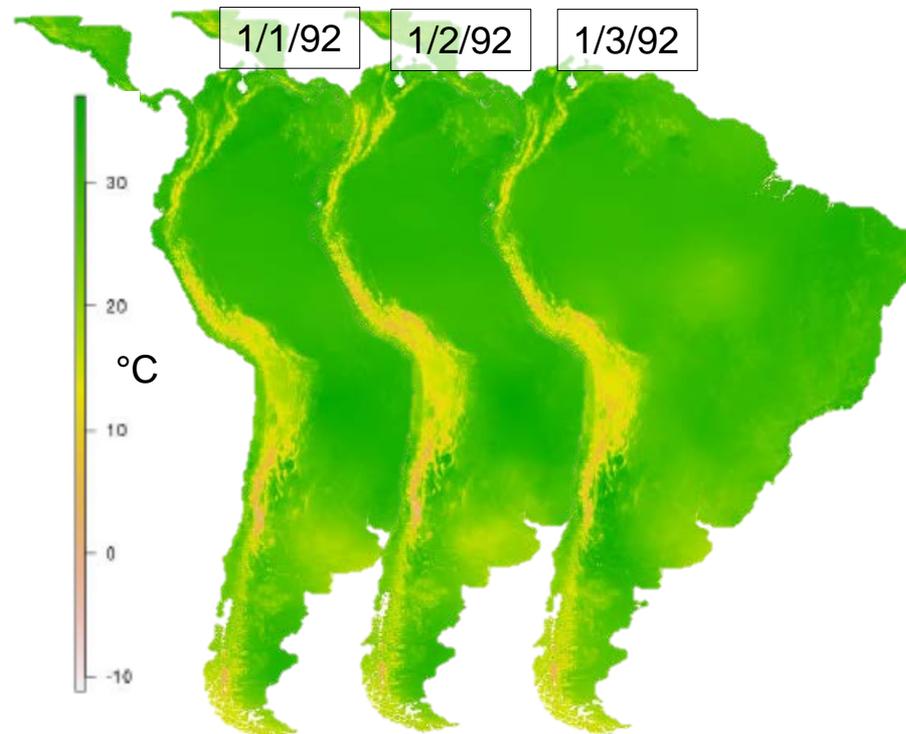
Species	Data	AUC
		0.87
		0.68
		0.87
		0.82



A multi-decadal time series of 1km daily temperature and precipitation



- MODIS cloud mask and LST data + met station data
- Available late 2016: earthenv.org



II. Develop informatics infrastructure

MOL
MAP OF LIFE

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Putting biodiversity on the map

194 Datasets
937,810 Species
371,807,359 Records } One Searchable Map

Map species
Views species range map, inventory, and occurrence data

Species by location
Select a location, filter by distance or group, and view a list of species along with source data

Species in Reserves *Pre-Release*
Pre-released at the World Parks Congress: Explore habitat suitability and reserve gaps for a set of species

Mobile App
Discover, identify, and record biodiversity worldwide

In the background: Green heron distribution map. // [view full image](#) / [interact with this map](#)

LATEST NEWS
Map of Life: An app that helps track wildlife
August 7, 2015
Research in the news: Spotting the knowledge gaps in biological species data

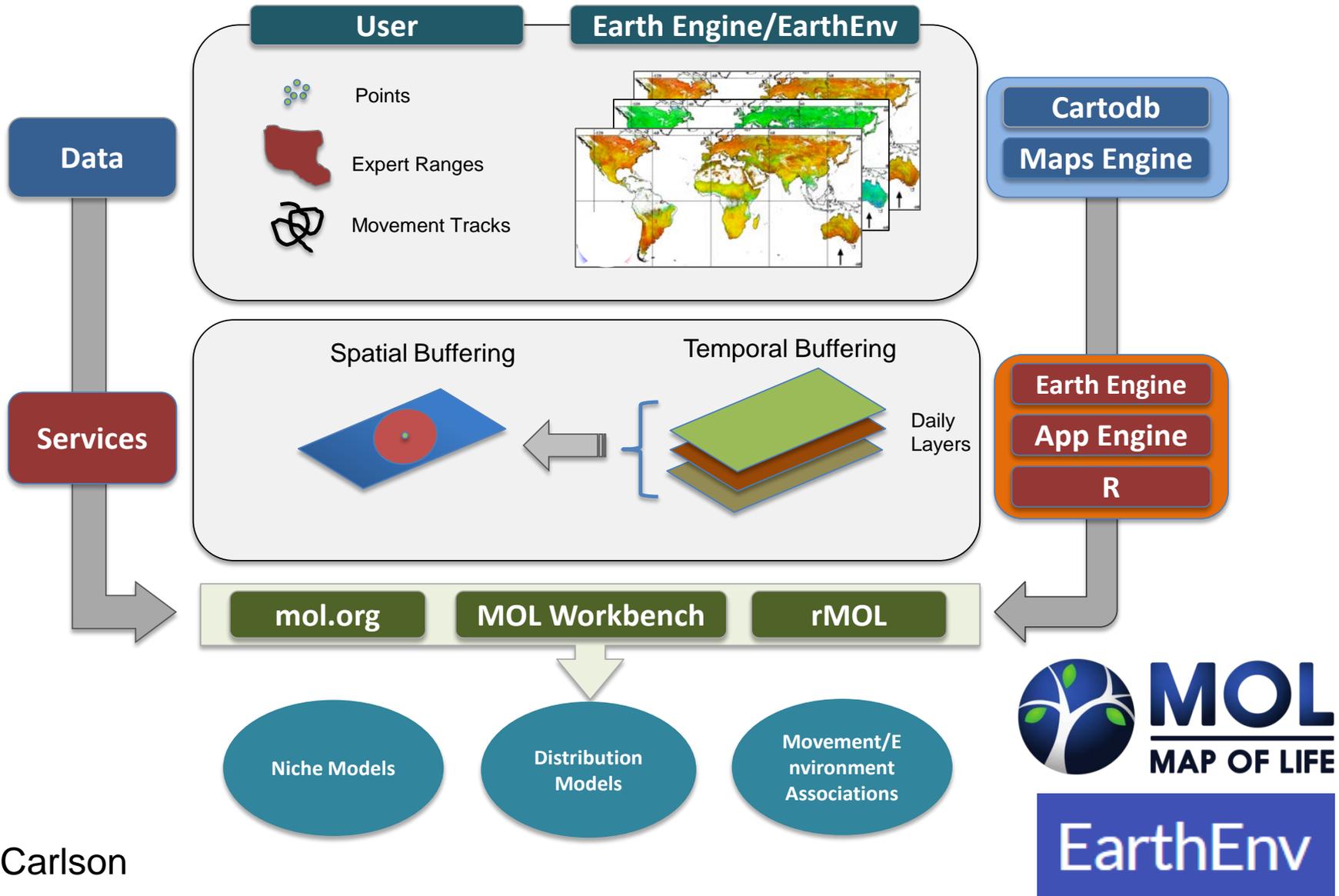
EXPLORE THE MAP
Species in Reserves
Species lists by location
Species maps

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II. Develop informatics infrastructure



III. Support global monitoring



Global Biodiversity Change Indicators

Model-based integration of remote-sensing & in situ observations
that enables dynamic updates and transparency at low cost



Google



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MAP OF LIFE



Species Info

Map a Species

Species Lists by Location

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Habitat Change

Reserve Coverage

Info

Select a species

Pick random

Birds

Bornean Stubtail *Urosphena whiteheadi*

Learn more

Update

Habitat Associations ON OFF

Elevation ON OFF

900 - 2600 meters

Tree cover: ON OFF

75 - 100%

Landcover ON OFF

Woodlands

Cultivated

Species in Reserves

Pre-Release

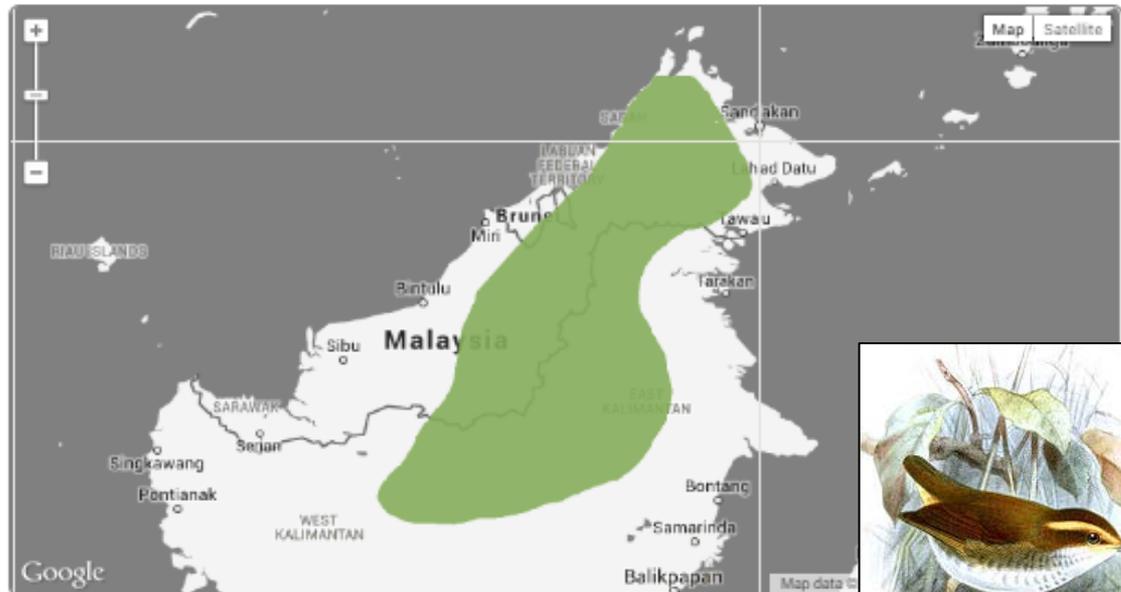


Explore habitat suitability and reserve gaps for a set of species pre-released at the 2014 World Parks Congress

Records outside suitable range

Records in suitable range

Suitable range



[Overview](#)[Habitat Distribution](#)[Habitat Change](#)[Reserve Coverage](#)[Info](#)

Bornean Stubtail *Urosphena whiteheadi*

[Learn more](#)[Update](#)[Records outside suitable range](#)[Records in suitable range](#)[Suitable range](#)

Habitat Associations ON OFF

Elevation ON OFF

900 - 2600 meters

**Tree cover:** ON OFF

75 - 100%

**Landcover** ON OFF

Woodlands

 Forests Woody Savannas

Cultivated

 Cropland Cropland Mosaics

Shrublands

 Open Closed

Barren Urban

 Barren Urban

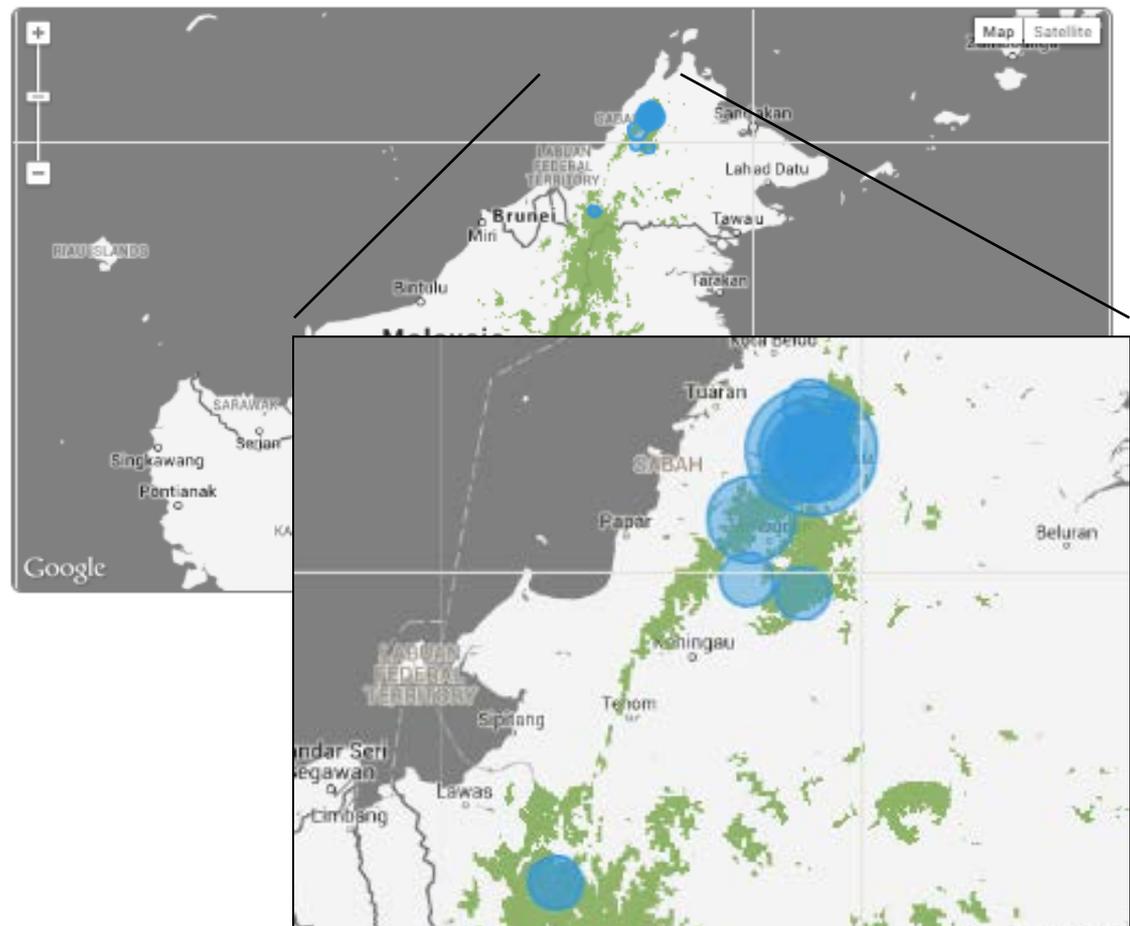
Herbaceous

 Savannas Grasslands

Water

 Wetlands Water Bodies

Geographic distribution

Range size 47,919 km² 218,276 km²



Species Info

Map a Species

Species Lists by Location

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Habitat Change

Reserve Coverage

Info

Ptilinichla leucogramr

Pick random

Birds

Bornean Wren-Babbler

Ptilinichla leucogrammica

Learn more

Update

Habitat Associations ON OFF

Elevation ON OFF

0 - 700 meters

Tree cover: ON OFF

75 - 100%

Landcover ON OFF

Woodlands

Forests

Woody Savannas

Shrublands

Open

Closed

Herbaceous

Cultivated

Cropland

Cropland Mosaics

Barren

Urban

Barren

Urban

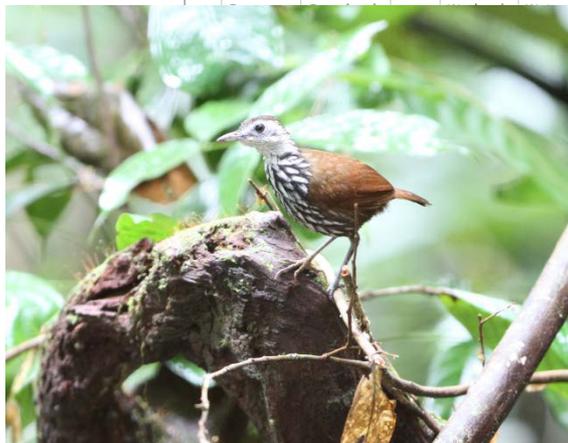
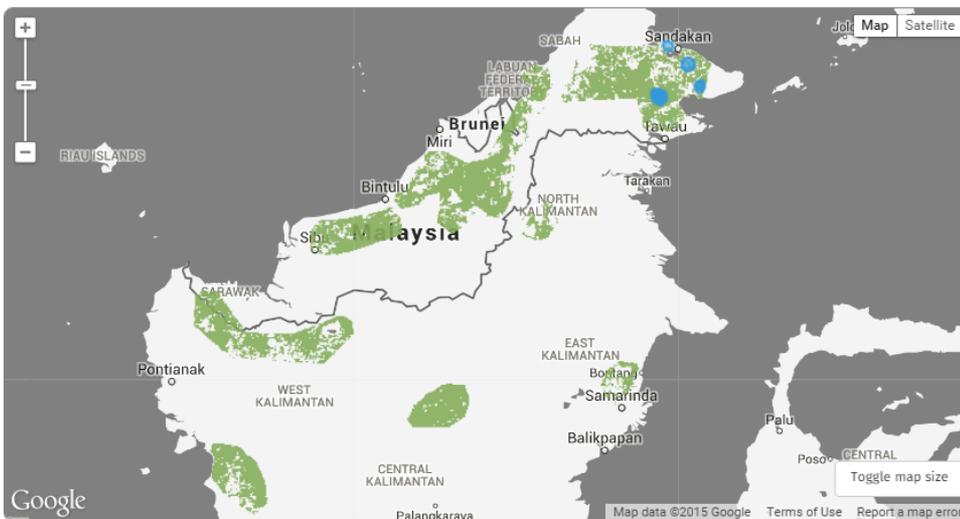
Water

Bodies

Records outside suitable range

Records in suitable range

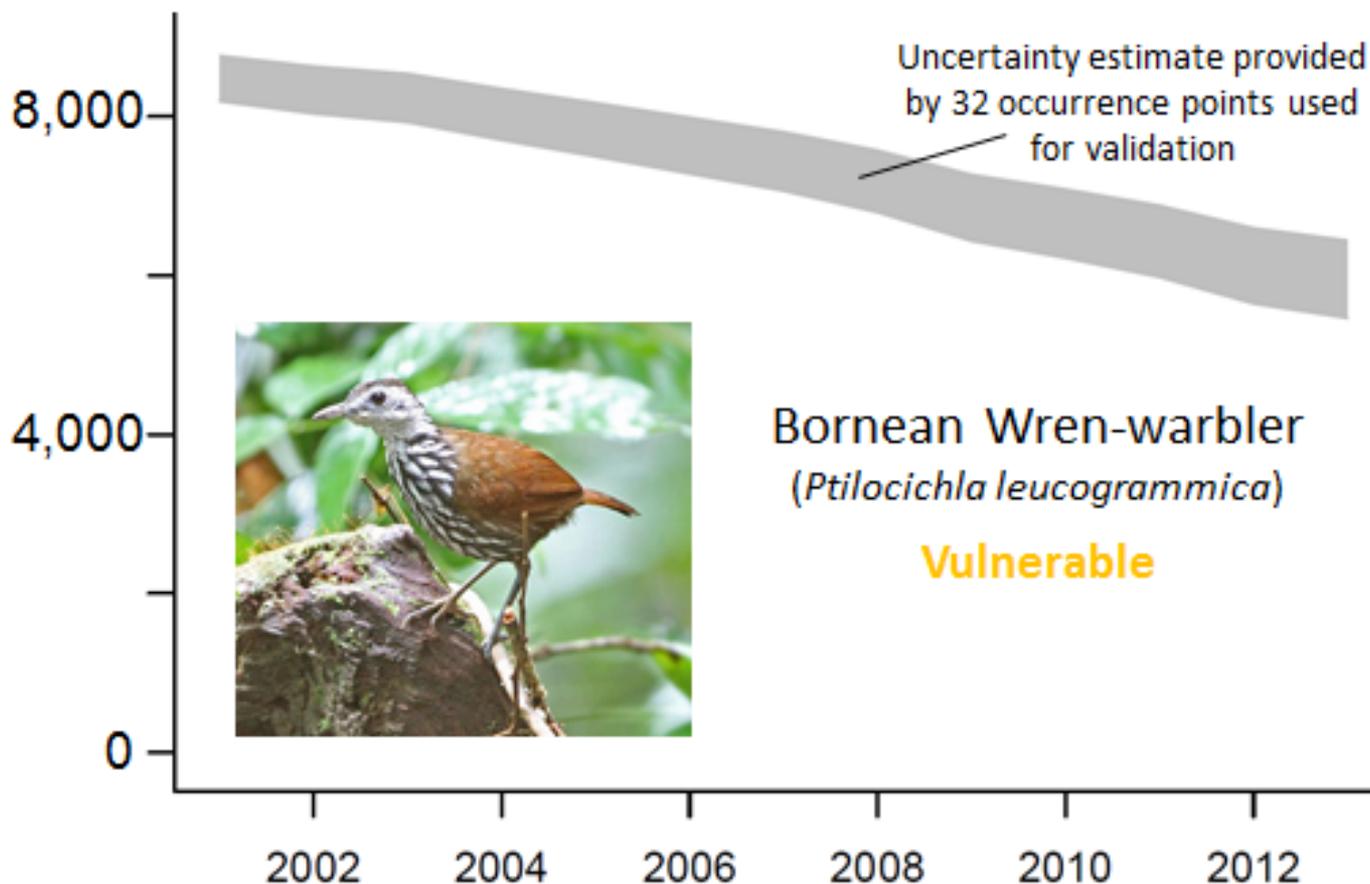
Suitable range



With support from Google Earth Engine



Suitable habitat (km²)





Thanks!